

## METHOD TO CREATE A HOT MELT FORM FOR USE WITH AN AIR INDUCTION ASSEMBLY

This application claims priority from provisional application serial number 60/159,850, filed October 15, 1999.

### BACKGROUND OF THE INVENTION

The present invention relates generally to a method for creating a form from a hot melt elastomeric foamed material for use with an air induction assembly.

A gasket with a "peel and stick" surface is commonly utilized in sealing an air induction cleaner. The gasket is made of polyurethane foam material and is supported by a mylar film applied to the surface. An adhesive is also applied to adhere the gasket to the part. Wax paper is placed over the adhesive surface to prevent adhesion to any other surface before application of the gasket to the part. When the gasket is to be applied to the part, the operator peels the wax paper from the foam material gasket, exposing the adhesive surface. The gasket is then positioned and applied over the surface of the part, creating a seal.

There are many drawbacks to utilizing the prior art gasket. For one, because the gasket is manufactured, it is of a fixed design and there is no flexibility to design changes in the air induction assembly. Additionally, the gasket is a manufactured part typically made at another location.

Hence, there is a need in the art for a method for creating a form from a hot melt elastomeric foamed material for use with an air induction assembly and on the air induction assembly.

### SUMMARY OF THE INVENTION

The present invention relates generally to a method for creating a form from a hot melt elastomeric foamed material for use with an air induction assembly.

A hot melt assembly is utilized for creating a gasket for an air induction system.

5 A solid block of thermal mastic elastomeric material is melted and blended with nitrogen gas to create a foamed material. Preferably, a dispensing gun applies a layer of base material, and then a layer of foamed material, around the perimeter of a lower shell. After the foamed material is allowed to cure, a cover is applied thereover, creating an air tight dust/water seal, the cover being removable if service is necessary.

10 Alternatively, the foamed material can be mixed with the base material and dispensed into a mold, creating a form of desired shape. The molded form is then applied and bonded to the surface of the lower shell.

Both of the above mentioned methods can also be employed to form an isolation pad bumper positioned between the air induction assembly and a vehicle mounting point.

15 The foamed material is attached to a bracket on a polypropylene 30% glass housing by either the above-mentioned foam-in-place method or the transfer molding method.

A seal can also be formed between the air cleaner lower shell and a mass air flow sensor of the air induction assembly. The hot melt material is dispensed into a mold positioned to surround the interior and exterior surface of the neck of the air cleaner  
20 lower shell. The lower shell with the attached melted material seal is removed from the mold, and a mass air flow sensor is inserted within the neck, the seal securing the sensor in place. Alternatively, the mass air flow sensor can be inserted within the neck first, and the hot melt material can be injected through an aperture in the neck, filling the space

between the outer diameter of the sensor and the inner diameter of the neck to secure the sensor within.

Accordingly, the present invention provides a method for creating a form from a hot melt elastomeric foamed material for use with an air induction assembly.

5        These and other features of the present invention will be best understood from the following specification and drawings.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

10        The various features and advantages of the invention will become apparent to those skilled in the art from the following detailed description of the currently preferred embodiment. The drawings that accompany the detailed description can be briefly described as follows:

Figure 1 illustrates the hot melt assembly of the present invention.

15        Figure 2 illustrates a side view of a hot melt foam-in-place form employed on a gasket on an air induction assembly.

Figure 3 illustrates a side view of a hot melt transfer molding form employed on a gasket on an air induction assembly.

Figure 3a illustrates a side view of a mold utilized to shape a hot melt form.

20        Figure 4 illustrates a side view of a hot melt foam isolation pad employed on an air induction assembly.

Figure 5 illustrates a side cross sectional view of a hot melt mold-in-place seal used to seal a mass air flow sensor housing.

Figure 5b illustrates a side cross sectional view of a mold utilized to shape a hot melt mold-in-place seal.

Figure 6 illustrates a side cross sectional view of an alternative embodiment of a hot melt mold-in-place seal used to seal a mass air flow sensor housing.

### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

Fig. 1 illustrates a hot melt assembly 10 utilized to create a hot melt foam for use with an air induction system 11 (shown in Fig. 2). A solid block of thermal mastic elastomeric material is heated and melted to the liquid form in a melting pot 12. The melted material is then fed through a feeding tube 14 into a mixing unit 16. Nitrogen gas stored in a nitrogen tank 18 enters the mixing unit 16 by a tank connector tube 20 and is blended with the hot melt material to create a foamed material 30 (shown in Fig. 2). The added nitrogen gas expands the melted material and changes the density. The amount of nitrogen added to the mixture is dependant on the required use.

After being thoroughly mixed, the foamed material 30 is fed through material lines 22 to a dual nozzle dispensing gun 24 attached to a robot. The robot and the gun 24 apply a layer of non-foamed base material 26 to the surface of a lower shell, as shown in Fig. 2. The base material 26 is a thermal mastic blend and acts as a bonding agent, attaching a foamed material 30 to the lower shell 28. Nitrogen gas is not mixed with the base material 26 as the nitrogen gas will cause shrinkage (about 17%) during curing. After the application of the base material 26 to the surface of the lower shell 28, the foamed material 30 is applied by the gun 24 directly over the base material 26.

After the foamed material 30 is allowed to cure, an air cleaner cover 32 is applied over the cured foamed material 30 creating an air tight dust/water gasket 33. As the foam material 30 is cured and hardens, the air cleaner cover 32 does not adhere to the foamed material 30 and is removable when service is necessary.

Alternatively, as shown in Fig. 3, the foamed material 30 and the base material 26 can be combined to form a mixed material 36. The mixed material 36 is dispensed by injection into a hollow mold 34 by a tool to create a form of desired shape. By using a mold 34, the profile and the shape of the gasket 33 can be controlled. The mold 34 is shown schematically in Fig. 3b. The molded mixed material 36 is transferred to the lower shell 28 and bonds thereto by means of the blended base material. The mold 34 is then removed, leaving the gasket 33 attached to the lower shell 28.

The above-mentioned foam-in-place and the transfer molding methods can also be employed in forming an isolation pad for use with the air induction assembly 111, as shown in Fig. 4. After application of the base material 126 to a bracket 138 positioned on a housing 128, the foamed material 130 is applied to create an isolation pad 133. The isolation pad 133 absorbs shock from the engine during high torque conditions and prevents contact between the bracket 138 and the vehicle mounting point 132. Additionally, the foamed material 130 and the base material 126 can be combined to form a molded mixture which is dispensed into a mold to create an isolation pad 133. The molded mixture is transferred to the bracket 138 and bonds thereto, removing the isolation pad 133 from the mold. The parts are preferably made of polypropylene 30% glass material.

As illustrated in Fig. 5, a mold-in-place seal 233 can also be employed on an air induction assembly 211 between the neck 228 of an air cleaner lower shell 232 and the mass air flow sensor 238. The melted thermal mastic elastomeric material is dispensed into a mold 234, shown in Fig. 5b, surrounding the inner diameter and outer diameter of the neck 228 of an air cleaner lower shell 232, bonding thereto. After bonding, the lower shell 232 is removed from the mold 234, creating a seal 233.

Fig. 6 illustrates another method of securing the mass air flow sensor 238 within the air cleaner lower shell neck 228, the neck 228 further including an aperture 240. The mass air flow sensor 238 having an outer diameter smaller than the inner diameter of the lower shell neck 228 is positioned within the neck 228. The hot melt material is dispensed through the aperture 240 in the neck 228, flowing around the inner diameter of the neck 228 and the outer diameter of the mass air flow sensor 238, creating a seal 233 securing the sensor 238 within.

There are several advantages to utilizing a hot melt foam-in-place form. For one, the process for manufacturing the hot melt form is more cost efficient, reducing material and waste. Additionally, there is an increase in flexibility in the manufacturing capabilities because the form can be dispensed on most configurations and is adaptable to future design changes. Finally, there are quality improvements. As the form is applied to directly to the surface of the part, the problem of misalignment of the form to the part is eliminated, increasing accuracy and reliability.

The foregoing description is only exemplary of the principles of the invention. Many modifications and variations of the present invention are possible in light of the above teachings. The preferred embodiments of this invention have been disclosed, however, so that one of ordinary skill in the art would recognize that certain modifications would come within the scope of this invention. It is, therefore, to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specially described. For that reason the following claims should be studied to determine the true scope and content of this invention.